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Texas Agricultural Extension Service

Texas Citrus Nursery Production

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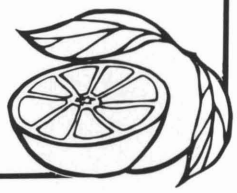

Citrus is susceptible to numerous diseases and pests which can dramatically affect orchard growth, productivity and profitability. The Texas citrus industry is protected from the accidental introduction of potential diseases and pests by state laws which prohibit the importation of citrus trees and budwood from other citrus production areas. Consequently, all trees used in the Texas citrus industry must be totally produced in Texas nurseries.

Field production of citrus nursery trees to be balled and burlapped for transplanting has been standard practice in Texas. However, advantages offered by container production have resulted in a significant increase in the number of container-grown trees in the last decade.

Major advantages of container production include:

- Smaller land area required, no need to change sites
- Growing in greenhouses/shadehouses provides climate control
- Sterile growing medium eliminates soil-borne diseases, insects, nematodes and weeds
- Production time of 12 to 18 months from seed, as compared to 24 to 36 months common to field nurseries
- Reduction of transplant shock because of transplanting entire plant with undisturbed root system

Major disadvantages of container production include:

- High initial capital investment for growing structures and climate control facilities and equipment
- Intensive management requirements

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- Smaller caliper trees—3/8 to 1/2-inch rather than 5/8 to 3/4-inch
- More frequent irrigation during orchard establishment

No significant differences have been reported between container-grown and field-grown trees in terms of time to come into production or in total yields, fruit size or quality. However, because of their younger age, the smaller container-grown trees tend to remain smaller than field-grown trees for several seasons after orchard establishment.

Sanitation

Citrus can be adversely affected by a number of virus diseases, all of which can be transmitted during budding. Many old-line selections of citrus in Texas have exocortis, xyloporosis and possibly other viruses. However, virus-free nucellar and shoot-tip grafted selections of all major citrus varieties have been developed and maintained by the Texas Agricultural Experiment Station and Texas A&I University.

Nurserymen using either Swingle citrumelo or Carrizo citrange should use virus-free budwood to preclude future problems from viruses which react severely with these two rootstocks. Because trees grown from virus-free budwood usually are more productive, nurserymen should obtain, establish and maintain virus-free budwood-source trees, regardless of rootstock. Using virus-free material requires sterilization of all propagation tools to keep the material virus-free.

Sterilize propagation tools by cleaning thoroughly and then spraying with a solution of 10 percent sodium hypochlorite (common chlorine bleach). A small spray bottle of the bleach solution

Sour orange seedlings.

is handy for spraying the cutting areas of propagation tools during nursery operations. Before storing, dry tools and coat them with protective oil to prevent rusting.

When collecting budwood from virus-free trees, sterilize the pruning clippers and re-sterilize before moving from one tree to the next. Sterilize budding knives before changing varieties of budwood being budded. Sterilize pruning tools used to remove sprouts or to head and shape nursery trees before moving from one variety to the next. All pruning of virus-free trees should be done with sterilized tools.

Rootstock Production

Seed. It is common practice in Texas to collect rootstock seed from fruit produced on root sprouts in existing orchards. However, it is recommended that seeds be purchased from certified sources or that nurserymen establish and maintain trees for rootstock seed production to assure uniformity of rootstocks year after year.

Rootstock seed are extracted from fruit normally harvested in November or December. Seed should be washed, surface-sterilized in hot water maintained at 125° F for 10 minutes, then dipped in one percent 8-hydroxyquinoline sulfate, air dried and packaged for storage or planting. Properly treated and packaged in sealed plastic bags, seed can be stored in a refrigerator for several months with little loss in viability.

Pre-plant soaking in aerated water maintained at 85° F for 24 hours will increase total germination, uniformity of germination and shorten germination time. Seeding in outdoor seedbeds is normally delayed until February or March, but greenhouse seeding in sterile media in seed trays, flats, tubes or cells can be done any time.

Germination and initial seedling growth in greenhouses can be further enhanced by using seedboxes designed and built to provide supplemental bottom heat to maintain constant 85° F temperature of the medium, supplemental lighting to provide 16 hours of light daily and use of polyethylene covering to maintain high relative humidity.

Seedlings. Seedlings for field nurseries are lined out in nursery rows in 4 to 6 months, at spacing of 6 to 12 inches. Row width is dependent upon mechanical equipment used in the nursery. Dipping the roots in a suitable fungicide may reduce transplanting losses.

Field nursery trees for transplanting.

Greenhouse-grown liners can be potted in sterile media in growing containers after 2 to 3 months. A number of containers are in use, including plastic bags and reusable plastic pots of various dimensions. Minimum dimensions of the various containers used locally are 4 to 5 inches wide and up to 10 inches deep.

Seedlings should be graded critically at transplanting. Those few that are obviously much larger than average are probably of hybrid origin and therefore should be discarded, as not true-to-type. Obviously, stunted seedlings should be discarded as they will probably never catch up to normal seedlings. Those having curved or crooked lower stems at or below the soil line should be dis-

carded, as such stocks will take years to outgrow such deformities.

Remaining seedlings may then be graded into two or three sizes and transplanted by size groups to establish blocks of uniform seedlings. Thus, all seedlings within a block should mature together, thereby receiving uniform treatment, requiring less labor and producing a high percentage of saleable trees from a given block at the same time.

Propagation

Budwood. It is not uncommon in Texas to randomly cut budwood from existing orchard trees or from nursery trees prior to sale. This practice, however, can result in the transmission of viruses and may perpetuate trees that are not true-to-type. Nurserymen are encouraged to establish and maintain budwood source trees that are known to be true-to-type and virus-free. Budwood to establish such trees is available from both university research centers in the Valley.

Budwood is selected from mature wood of the previous growth flush. Less mature, slightly angular wood can be used, particularly if extra care is exercised during insertion and wrapping. Budwood should be trimmed, labelled and placed dry into sealed plastic bags and stored under refrigeration until use. Under such conditions, budwood can be stored 6 to 8 weeks.

Budding. Budding height on the stock should be 6 to 8 inches, which normally provides ample height of the union to reduce the incidence of *Phytophthora* foot rot. Budders use either the T-budding method or the inverted T method for inserting the bud into the stock. Neither method offers any particular advantage over the other.

Wrapping materials consist of either polyethylene or polypropylene strips, available in widths of ½ to 1 inch. Although some colored wrappings are available, most propagators prefer strips which are clear to opaque.

Most field nurseries are budded in the spring following lining out, although earlier budding is possible. Container nurseries normally are budded 3 to 6 months following transplanting into containers.

Forcing. The buds should be well-callused within 12 to 14 days and should be unwrapped and inspected preparatory to forcing. Although immediate forcing is desirable, some bud failures may occur within a few days of unwrapping. Thus, delaying forcing 3 to 4 days permits forcing only viable buds, thereby saving labor and time in rebudding.

Container nursery under partial shade.

Topping the rootstock just above the bud provides the greatest stimulation to forcing. However, budling growth after forcing is somewhat slower and may be erratic. Too, topping precludes immediate rebudding in the event of bud failure.

Lopping involves cutting about halfway through the seedling top 1 to 2 inches above the bud, after which the top is broken over away from the bud. The old top continues to support the root sytem and budling, thereby providing good budling growth. Normally, the tops are removed completely when the budling achieves 10 to 12 inches of growth.

Bending provides the least stimulation to forcing, but supports maximum budling growth. Basically, the top of the rootstock is bent down away from the bud and tied to its own base below the bud. The top will remain until the budling achieves 10 to 12 inches of growth, at which time it will be cut off just above the bud.

Aftercare. Rootstock sprouts below the bud should be removed periodically to avoid competition with the budling. Emerging buds can be easily rubbed off or broken off but larger sprouts may need to be cut off.

When the initial growth of the budling has hardened off, a stake is placed next to it for protection and support. Stakes may be metal, plastic, wood or bamboo—lengths of 2 to 3 feet

Citrus budlings growing out.

are commonly used. At 4 to 6 inches of growth, the budling should be pulled to the stake and tied to it, with additional ties every 4 to 6 inches as the budling grows. All lateral buds which grow from the forming trunk should be removed regularly to direct all growth into a single, upright stem. At 18 to 20 inches of growth, the budling top is cut off to stimulate lateral branching (heading).

Finishing. Prior to movement from the nursery, container-grown trees may benefit from a short period of hardening-off. This entails placing the trees in a holding area where they are exposed to the natural climatic elements for 1 to 2 weeks.

Field-grown trees are cut back to the scaffold branches in preparation for digging. Those cut back and dug immediately prior to a growth flush generally respond better upon transplanting than do those cut back and dug during a growth flush.

Spring-budded field nursery trees should be ready for digging in the fall, although selective digging may be necessary. Thus, the field nursery tree is finished about 24 months after seed collection. Container nurseries produce a smaller caliper finished tree in 12 to 15 months after seed collection. Both systems can take another 6 months to finish, primarily because of inadequate culling and grading of liners, percentage of rebudding required, slow growth resulting from sub-optimal care and, in the case of field nurseries, slower growth because of climatic conditions.

Cultural Practices

Irrigation. Optimal irrigation should be provided to both field and container nurseries to maintain adequate soil moisture without waterlogging. Container nurseries frequently are established with automatic watering systems. The size of the container limits rooting volume and the growing medium has only a limited reservoir of available moisture. Consequently, water must be applied frequently and regularly to maintain adequate moisture.

Nutrition. Some container nurseries routinely incorporate a slow release fertilizer into the growing medium while others simply topdress during production. In either case, water-soluble fertilizers are applied during irrigation, either during each irrigation or weekly. Constant fertilization should provide rates of 75 to 100 ppm total nitrogen, whereas weekly fertilization of 200 to 300 ppm nitrogen is acceptable. Both rates are roughly equivalent to 0.02 to 0.03 pound of actual nitrogen per tree per year, depending upon watering frequency, and volume and leaching losses.

Generally, field nurseries should receive 100 to 200 pounds of nitrogen per acre annually in multiple split-applications at intervals of approximately 30 to 45 days from late winter through summer. The acutal fertilizer program will vary with soil type, plant response and grower experience.

Weed Control. Weeds in container operations are rarely a problem, but weed growth should be eliminated where appropriate. Weed competition in field nurseries should be eliminated by the use of appropriate pre-emergence and post-emergence herbicides or by mechanical means.

Pests. Typical orchard pests can affect nurseries. Nurseries also can experience damage from caterpillars, cutworms, slugs, snails and rodents. Good pest control is essential to the production of high quality nursery trees.

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